

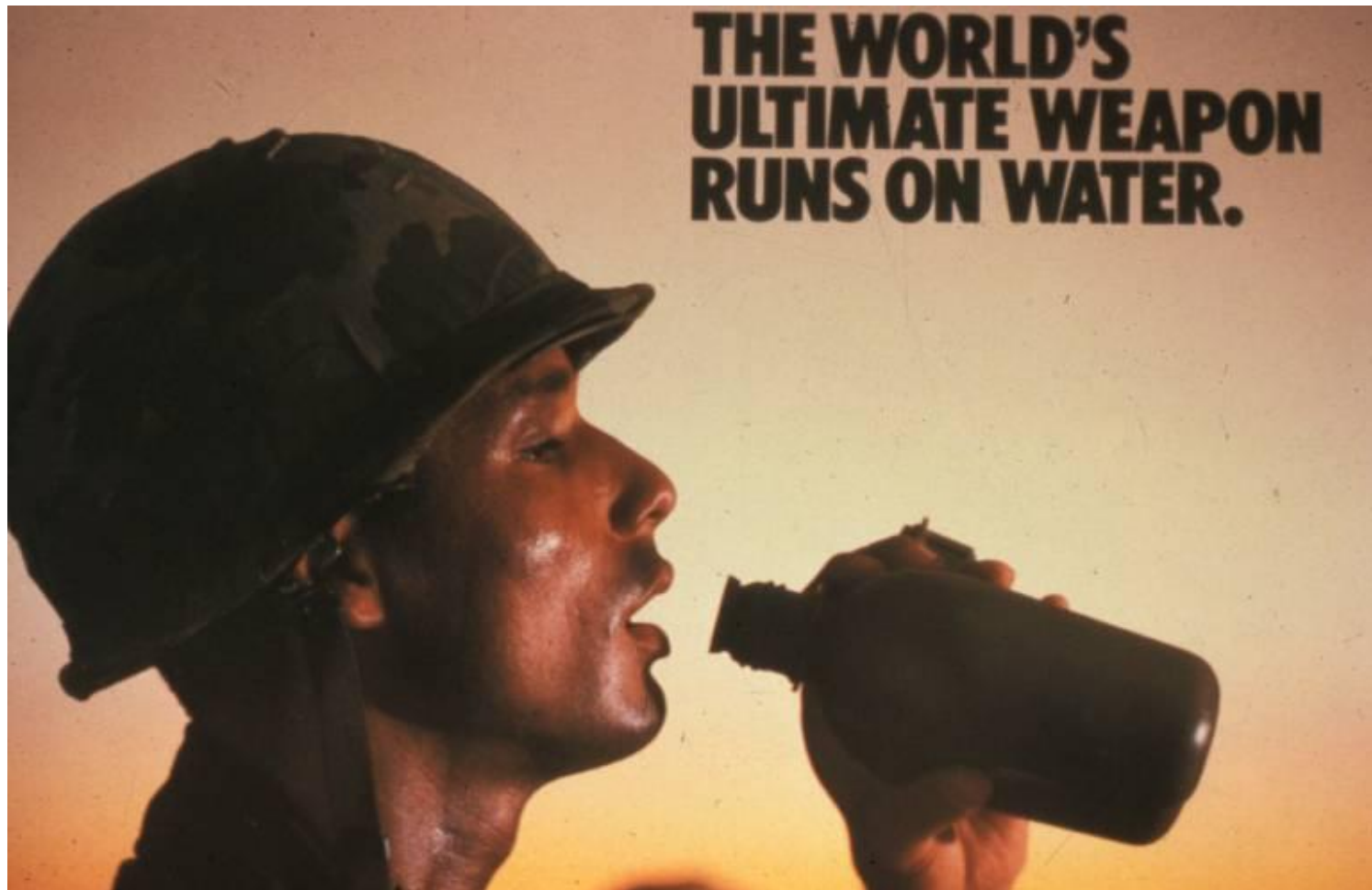
# **Water Usage at Forward Operating Bases**

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U.S. Army ERDC-CERL  
Champaign, IL 61826-9005**

**2010 Environment, Energy & Sustainability  
Symposium & Exhibition  
14-17 June, 2010 Denver, CO**

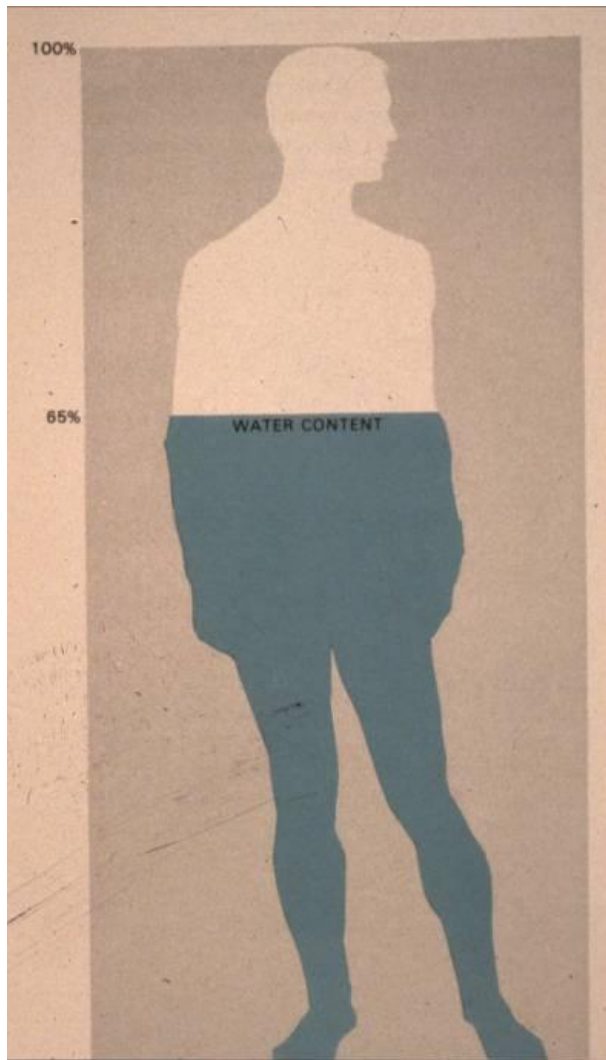


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**Lessons learned in Iraq and Afghanistan show that water is as costly as fuel when delivered to FOBs**

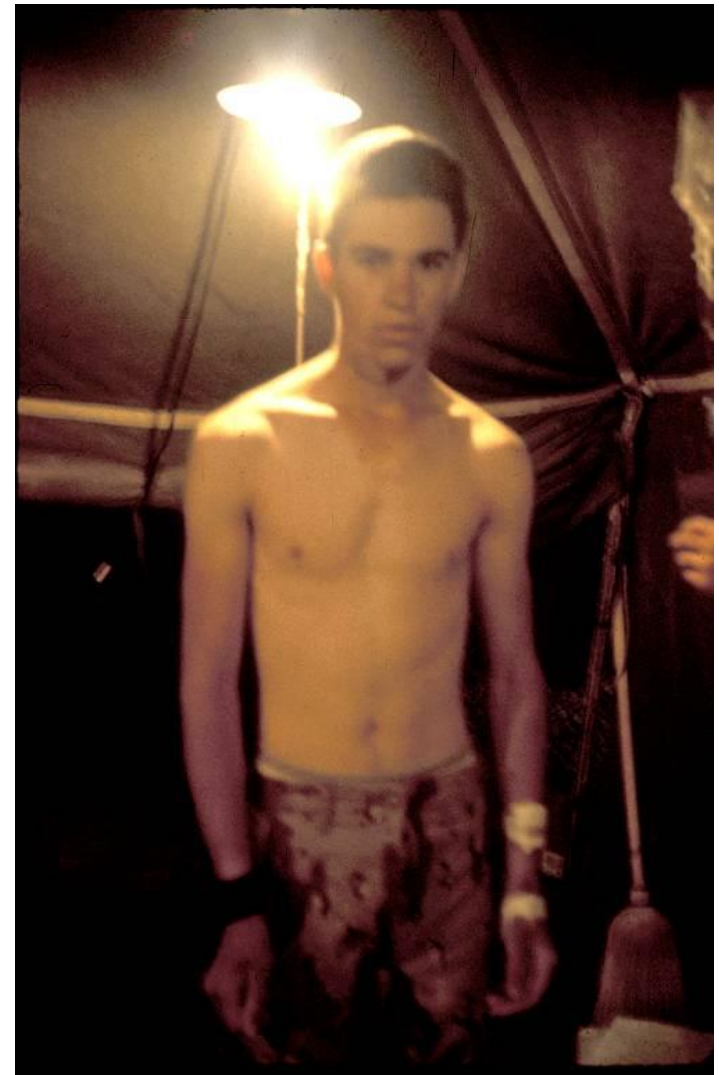




**Water is just as mission critical as fuel, food and ammunition.**



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**Preventable heat-related casualties**

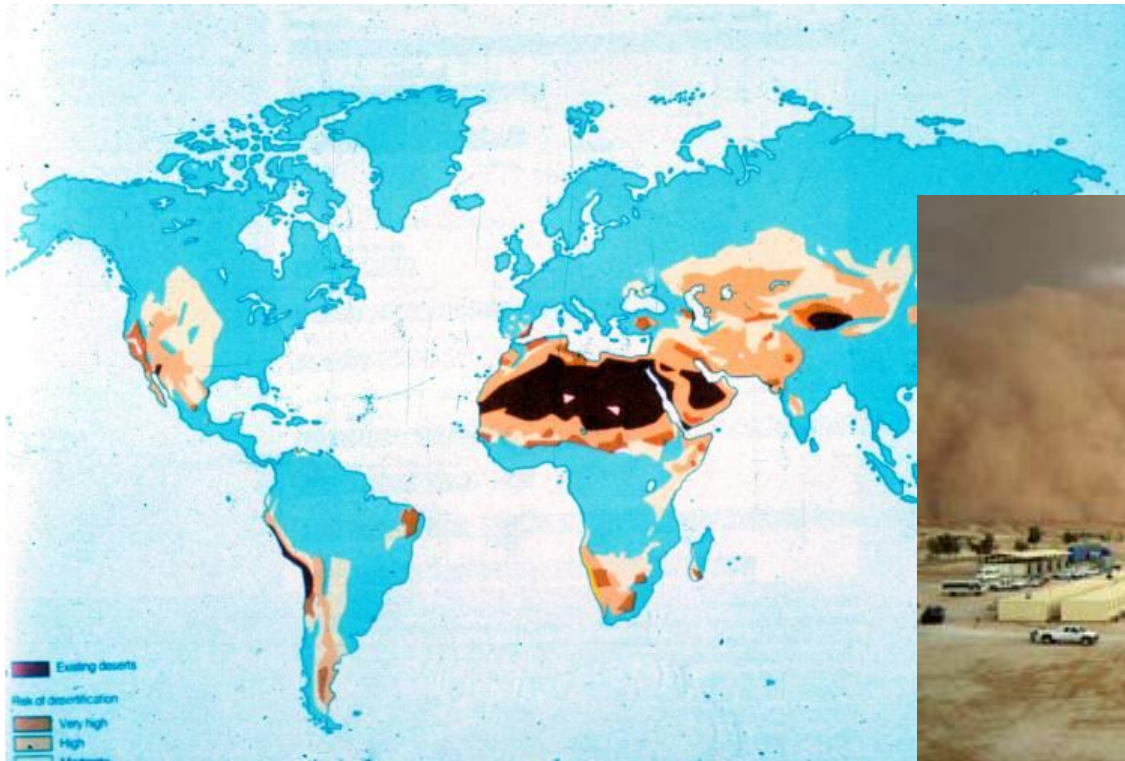
**Engineer Research and Development Center**



**Unless one has experienced the extreme heat of soldier activities, one may not appreciate the amount of water required to cool down the body temperature. This is one example of how planning factors may not actually reflect how soldiers use water on a daily basis.**







**Not all arid regions are equal. Should planning factors be refined/customized to reflect differences?**



**The Army is learning -- by experience -- how to manage water in the oppressive and harsh desert environments. Therefore, planning will probably continue to evolve.**



# Goals

- **Determine water demand planning factors from literature sources**
- **Quantify actual usage at Forward Operating Bases**
  - **Three general classes:**
    - **Small outposts (Company) of up to 120 personnel**
    - **Medium size bases (Battalion) of approximately 1,000 personnel**
    - **Large bases (Brigade) above 12,000 personnel**



# CASCOM Internet Planning Tool

FORCE DEVELOPMENT DIRECTORATE  
UNITED STATES ARMY COMBINED ARMS SUPPORT COMMAND  
FORT LEE, VIRGINIA 23801-1809



## WATER PLANNING GUIDE

25 November 2008



**POTABLE WATER CONSUMPTION PLANNING FACTORS  
BY ENVIRONMENTAL REGION AND COMMAND LEVEL**



<https://tsunami.tec.army.mil/externalpages/water/calc/Global.htm>





Topographic Engineering Center  
Water Consumption Calculator

**STEP 3:** Enter options, then  
press the button for results.

<b>Enter Number of Soldiers:</b>	<input type="text" value="12000"/>																																																												
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Per capita  
Use Estimate

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# CASCOM Computer Tool Estimate

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# Minimum Estimates from non-DOD Sources

- WHO recommends 50 liter per person per day
  - Gleick, P.H. (1996), “Basic Water Requirements for Human Activities: Meeting Basic Needs”, *Water International*, v21, p83
  - 50 liters is 13.2 gallons
    - Independent estimate is very close to CASCOM baseline planning factor



# Current Practice Estimated Requirements (kgal/day)

Unit	CASCOM	KBR Planning Guide
Company (120)	1.5	2.2
Battalion (1,000)	12.7	18.4
Brigade (12,000)	153	221



# Drivers

- Adequate water is essential to maintaining soldier performance in arid environments
- Lack of local sources results in requirement for water deliveries by convoy
- Cost of delivered water is estimated to be equal to or greater than fuel costs
  - AEPI Study estimated \$17/gal (Immature Theater)
    - “Sustain the Mission Project: Energy and Water Costing Methodology and Decision Support Tool,” Final Technical Report, AEPI, July, 2008
  - Estimates as high as \$400/gal





# **Actual Planning Factors used by KBR**

- **18.4 gpcd min, 50 gpcd with DFAC, Ice, laundry and wash rack operations**
  - **Concept of Support Overview, Iraq Theater of Operations, 13 Mar 09**
- **50 gpcd**
  - **3rd Army, Central Coalition Forces Land Component Command, ARCENT Staff Estimate, Afghan Planning, 30 NOV 09**



# WATER REQUIREMENTS

## Per Soldier/Civilian/Contractor

Low



Personal Need  
(consumption, cooking)



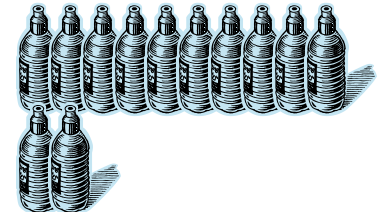
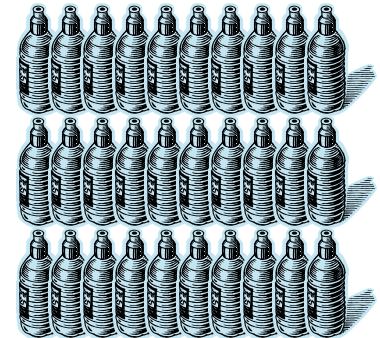
Other uses (bathing,  
washing clothes,  
sanitation, etc.)




Waste (20-30%)

26 Gallons

High



52 Gallons

 = 1 gallon



# Field Data Collected to Date

- **Bright Start 83: 13 gpcd at Cairo West**
  - **Example of large FOB at ~7,500 personnel**
    - **Bright Star 83 After Action Report: Water Management (Production/Consumption) and Heat Stress Management, Bandy, J., et al USACERL, March 1984**
- **Camp Bulwark, Bulgaria: 20 gpcd**
  - **Example of Battalion Level FOB at 1,100 personnel**
    - **Base Camp Solid Waste Characterization Study, US Army Corps of Engineers, Europe District, DACA90-02-D-0085, DO 0028, BH Project 06200-28**
- **Kabul, Afghanistan: 1 gpcd, July and August, 2009, issued to ~17,000 personnel**
  - **Base size unknown, assumed to be only personal consumption water, very low and well below recommended**
    - **E-mail from SSG, through USA AMC**



# Ft. Irwin Shower Site

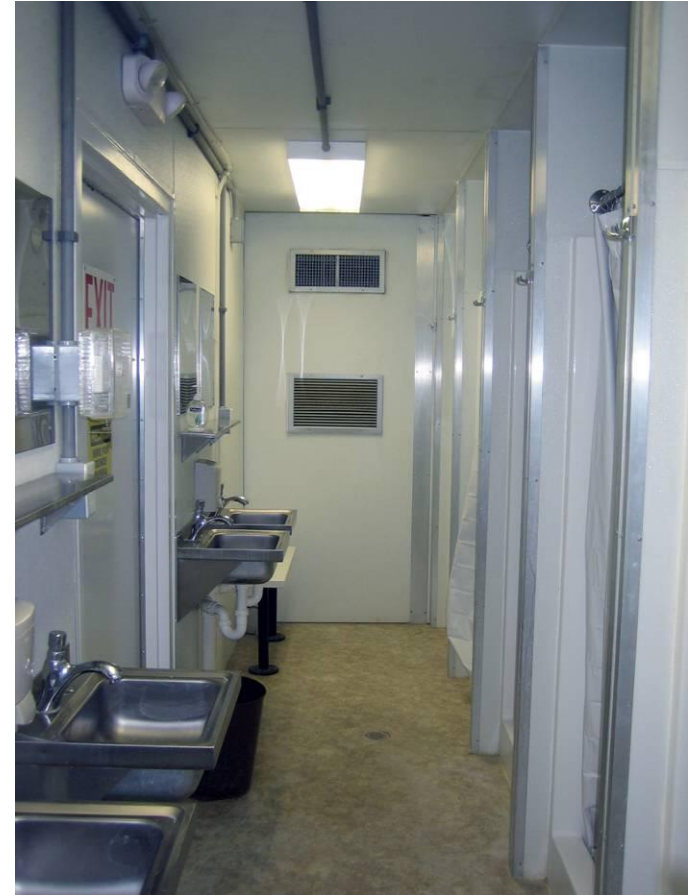


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# Camp Atterbury FOB Shower Trailer



# Field Data Collected to Date

## (Continued)

- **Fort Irwin Training Center: 60-80 gpcd**
  - **Size basis for estimate unknown**
    - **Estimate generated by CERL during visit, February 2010, evaluating water withdrawals from aquifer**
- **Camp Atterbury: 6 – 23 gpcd**

Unit	JUN 09	JUL 09	AUG 09	SEP 09	OCT 09	NOV 09	DEC 09	JAN 10
Gal	196,000	370,000	167,000	384,000	490,000	74,000	41,000	40,800
PAX	620	1120	570	640	730	350	225	180
gpcd	10.5	11	9.8	20	22.7	7	6.1	7.6



# Variability in Field Water Use

- **Water use in theater will vary depending on availability**
- **Overall water usage expected to be greater than planning factors**
- **However, when water is unavailable by any other means than convoy transport, planning factors should be considered the lower limit for water usage**



# Summary

- **Data on actual water usage difficult to obtain**
- **KBR planning factors ~50% greater than COSCOM recommendations**
- **Range of Estimates: 13 to 80 gpcd**
  - **Example of 1 gpcd discarded as incomplete estimate**





# Can you Help?

- Any data you may have for FOBs will be useful
- Locations need to indicate country only
  - i.e., U.S training facility, Iraq, Afghanistan
- Data needed would be:
  - Water used
  - Duration over which usage measured
  - Average population during that period
    - Including contractors



# Contact Information

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